

ABSTRACT

An optical interleaver for receiving an incident beam carrying a wavelength-division-multiplexed (WDM) signal comprising a plurality of channels at center wavelengths $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5, \lambda_6, \dots$ and generating therefrom at least one de-interleaved output signal comprising the odd channels $\lambda_1, \lambda_3, \lambda_5, \dots$ or the even channels $\lambda_2, \lambda_4, \lambda_6, \dots$ is described. The optical interleaver comprises a splitting element for splitting an incident beam into a first optical signal directed along a first path and a second optical signal directed along a second path, a first resonant element positioned along the first path, a second resonant element positioned along the second path, and a combining element positioned to receive and to interferometrically combine the outputs of the first and second resonant to produce the output signal. The optical interleaver may be implemented using a free-space configuration using a beamsplitter and a plurality of resonant cavities such as asymmetric Fabry-Perot resonators or Michelson-Gires-Tournois resonators. In an alternative preferred embodiment, the optical interleaver may be implemented in a Mach-Zender-style configuration using couplers and fiber ring resonators. According to a preferred embodiment in which the optical interleaver is in a free-space configuration, the splitting element that receives the incident beam comprises a partially reflective surface positioned such that a normal to the reflective surface is at a less-than-30 degree angle with respect to the incoming beam for increased stability against polarizations in the incoming beam. According to another preferred embodiment, thermal stability of the optical interleaver is enhanced by configuring and dimensioning the optical interleaver such that the amount of glass or other optical material in the first and second split-beam paths is equalized. In accordance with reciprocity principles, the optical interleaver is readily adapted to operate as an interleaver, de-interleaver, or add/drop multiplexer.

25